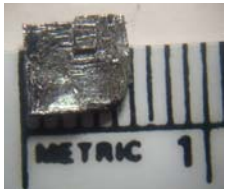
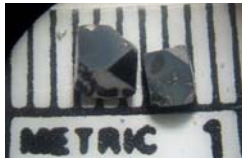
Crystal-Chemical Relationships of Correlated Electronic Materials

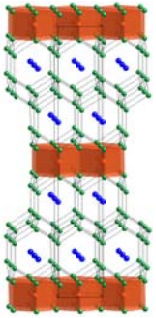


Julia Y. Chan

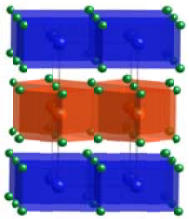
DMR-0237664



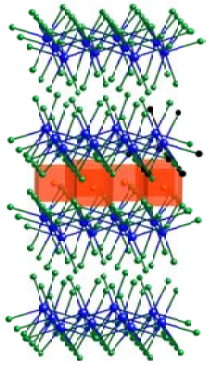
The details of a single crystal structure can provide deep insights into the relationship between structure and electronic properties which can make a substantial impact on technology. This has been illustrated for the structure-sensitive physical properties such as superconductivity and magnetism. My research program is aimed at the exploration of the rewarding boundary between crystallography and the systematic study of structure-dependent properties such as superconductivity and magnetism in rare earth intermetallics. Shown below are 3 new compounds correlating the magnetic transitions with effects of dimensionality, coordination, and hybridization. Bottom right shows a new heavy fermion intermetallic compound, Tb_4MGa_{12} (M = Pt, Pd).



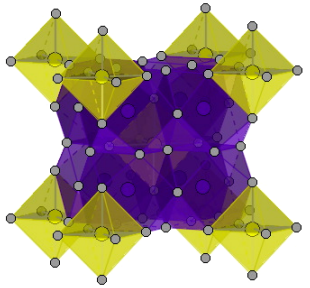
Ce_2PdGa_{10}



$CePdGa_6$



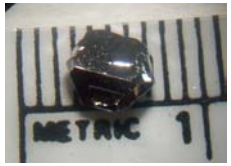
Ce_2PdGa_{12}



New Heavy Fermion !
Tb_4MGa_{12}

The lack of magnetic ordering down to 2 K in Ce_2PdGa_{10} may be due to the reduced Ce-Ga interactions (reduced hybridization)

Ce *f* moments interact through RKKY interactions by hybridization with conduction electrons of surrounding Ga atoms, however, comparing Ce_2PdGa_{12} with $CePdGa_6$, more Ce-Ga interactions i.e. more local moment/ conduction electron interactions = higher T_N



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Education:

PI showing students high temperature synthesis (above) and undergraduates the packing of solids (below) in front of an X-ray Diffractometer.

Outreach:

Shawn Liner, a high school teacher spent his summer putting together materials science demonstrations for future LSU students. Demonstrations include superconductivity, smart metal alloys[1] and ferrofluids.[2] Undergraduates and graduate students from the group perform experiments to K-12 students every semester.

This summer, he started a new project on crystal growth of Ln-Co-Sn system along with two other undergraduates. We will begin a crystal growth contest this fall.

Nitinol Braces

http://www.cnn.com/HEALTH/9811/02/space.medical/

Ferrofluids

http://www.technorama.ch/ausstellung/magnetismus.html

Graduate Students:

Robin Macaluso, Erick Lawson, Willa Williams, Evan Thomas, Jasmine Millican (3 Female, 4 African Americans)

Undergraduates: Andrew Bankston, Erin Erickson, Nathan Henderson, Parker Collin